As requested by the Examiner, the specification has been amended to provide sequence identifiers and a brief explanation of each identifier for all nucleotide and polypeptide sequences disclosed therein. Consequently, a substitute Sequence Listing is filed concurrently herewith to reflect the amendments to the specification. Support for SEQ ID NOs: 19-21 is found in Figures 3 and 8. Support for SEQ ID NOs: 22-25 is found in Figure 4. Support for SEQ ID NOs: 26-30 is found in Figure 5. Support for SEQ ID NOs: 31-36 is found in Figure 6.

The specification has further been amended, as directed by the Examiner, to correct a typographical error in the substitute specification submitted on February 11, 2002, by replacing the recitation of "pH.45" with --pH 4.5--. Support for this amendment is found in the specification as originally filed at, for example, page 9, line 8.

Claim 24 has been amended to be an independent claim and in the manner set forth above. Support for this amendment can be found in original claim 24, and in the specification at, for example, pages 8-10 and pages 11-12. *See In re Gardner*, 177 USPQ 396, 397 (CCPA 1973) and MPEP §§ 608.01 (o) and (l).

Claim 25 has been amended in the manner set forth above. Support for this amendment can be found in original claim 25, and in the specification at, for example, pages 8-10 and pages 11-12. *See Id.*

Claim 26 has been amended in the manner set forth above. Support for this amendment can be found in original claim 26, and in the specification at, for example, pages 8-10 and page 12. *See Id.*

Claim 27 has been amended to be an independent claim and in the manner set forth above. Support for this amendment can be found in original claim 27, and in the specification at, for example, pages 8-10 and page 12. *See Id.*

Claim 28 has been amended in the manner set forth above. Support for this amendment can be found in original claim 28, and in the specification at, for example, pages 8-9 and pages 12-13. *See Id.*

Claims 29 and 30 have been amended to be independent claims and in the manner set forth above. Support for this amendment can be found in original claims 29 and 30, and in the specification at, for example, pages 8-9 and pages 12-13. *See Id.*

Claims 31 and 40 have been amended in the manner set forth above. Support for this amendment can be found in original claims 31 and 40, and in the specification at, for example, pages 8-9 and pages 11-13. *See Id.*

Claims 32 and 41 have been amended to be independent claims and in the manner set forth above. Support for this amendment can be found in original claims 32 and 41, and in the specification at, for example, pages 8-9 and pages 11-13. *See Id.*

Claim 46 has been amended to be an independent claim and in the manner set forth above. Support for this amendment can be found in original claim 46, and in the specification at, for example, pages 8-9 and pages 11-13. *See Id.*

Claim 37 has been amended to remove its dependence from claim 36 and instead to depend form claim --34--, and to replace the term "biological or taxonomic homolog" with --biologically and/or taxonomically homogeneous culture--. Support for this amendment can be found in the specification at, for example, pages 8-10.

Claim 44 has been amended to recite that the recombinant microorganism is --obtained from-- *Gluconobacter oxydans* DSM 4025. Support for this amendment can be found in the specification at, for example, page 22.

Claim 45 has been amended to remove its dependence from claim 44 and instead to depend form claim --40--, and to replace the term "biological or taxonomic homolog" with --biologically and/or taxonomically homogeneous culture--. Support for this amendment can be found in the specification at, for example, pages 8-10.

Claims 57-59 have been added. Support for these claims can be found in the specification at, for example, pages 8-10, pages 11-13, and pages 14-16.

Claims 60, 62-64, 66-68, 70-72, 74, 75, 77, 78 and 80 have also been added. Support for these claims can be found in original claims 1 and 5-9, and in the specification at, for example, page 10 and pages 14-16.

Claims 61, 65, 69, 73, 76, and 79 have also been added. Support for these claims can be found in original claim 3, and in the specification at, for example, page 10 and pages 8-9.

It is submitted that no new matter has been introduced by the foregoing amendments and added claims. Approval and entry of the amendments and claims is respectfully solicited.

Objections to Specification

The specification was objected to in view of the sequence listing rules set forth in 37 CFR §1.821 *et seq.* (Paper No. 9 at 3). In making the objection, the

Examiner required that sequence identifiers be provided for the nucleotide sequences set forth in Figures 3-6 and 8. (*Id.*).

In accordance with the Examiner's request, the specification has been amended to replace the existing Sequence Listing with the substitute Sequence Listing attached hereto as Exhibit 1. The substitute Sequence Listing includes SEQ ID NOs: 19-36, which correspond to the DNA sequences set forth in Figures 3-6 and 8.

A computer readable form of the substitute Sequence Listing is also submitted and attached hereto as Exhibit 4. The contents of the substitute Sequence Listing and the computer readable form are, upon information and belief, the same. No new matter has been added. (37 CFR § 1.821(a) and (b)).

In addition, the specification has been amended as set forth above, and as requested by the Examiner, to include the sequence identifiers for SEQ ID NOs: 19-36 as well as a brief description of the respective sequences to which the sequence identifiers correspond in the section of the application entitled "Brief Description of the Figures." In view of the foregoing, it respectfully is submitted that the objection is rendered moot and should be withdrawn.

The Examiner also objected to the specification allegedly "because it is unclear what is intended to be indicated where 'pH.45' is typed on page 9, clause (e)." (Paper No. 9 at 3).

As required by the Examiner, "pH.45" has been replaced with --pH 4.5--. Accordingly, it is respectfully submitted that the objection is rendered moot and should be withdrawn.

Objections to Claims

Claims 24, 27, 30, 32, 41, 46, and dependent claims 47-50 were objected to as depending from claims 1-9 that were withdrawn by the Examiner pursuant to a restriction requirement. (Paper No. 9 at 3).

With a view towards furthering prosecution, claims 24, 27, 30, 32, 41 and 46 have been amended to remove their dependence from claims 1-9. Accordingly, it is respectfully submitted that the objection is rendered moot and should be withdrawn.

Claims 24, 27, 30, 32, 41 and 46-50 were objected to under 37 CFR § 1.75(c). (Paper No. 9 at 4). In making the objection, the Examiner asserted that the claims are in "improper form because a multiple dependent claim should refer to other claims in the alternative only and cannot depend from any other multiple dependent claim." (*Id.*).

With a view towards furthering prosecution, claims 24, 27, 30, 32, 41 and 46 have been amended. It is respectfully submitted that claims 24, 27, 30, 32, 41 and 46-50, as amended, are in full compliance with the requirements of 37 CFR § 1.75(c). Accordingly, the objection is rendered moot and should be withdrawn.

Claims 37 and 45 also were objected to under 37 CFR § 1.75(c). (*Id.*). In making the objection, the Examiner asserted that the claims are "of improper dependent form for failing to further limit the subject matter of a previous claim." (*Id.*).

With a view towards furthering prosecution, claims 37 and 45 have been amended to remove their dependence on claims 36 and 44, respectively, and instead to depend from claims 34 and 40. It is respectfully submitted that claims 37 and 45, as

amended, are in full compliance with the requirements of 37 CFR § 1.75(c). Accordingly, the objection is rendered moot and should be withdrawn.

§112, Second Paragraph Rejections

Claims 37, 44 and 45 were rejected under 35 U.S.C. § 112, second paragraph. (Paper No. 9 at 11). In making the rejection, the Examiner asserted that claims 37 and 45 are indefinite because they "recite the term 'a biological or taxonomic homolog of a microorganism having the identifying characteristics of *Gluconobacter oxydans* DSM 4025'... [t]he term is not specifically defined." (*Id.*).

With a view towards furthering prosecution, claims 37 and 45 have been amended to replace the phrase "biological or taxonomic homolog" with the phrase --a biologically and/or taxonomically homogeneous culture--. This phrase is specifically defined in the specification as describing a "microorganism that has at least 12 out of 14" specifically defined characteristics. (*See e.g.*, pages 9-10).

As is well accepted, an applicant is free to provide a definition in the specification for a term recited in the claims. *Autogiro Co. of America v. United States*, 155 USPQ 697, 702 (Ct. Cl. 1967) ("patent law allows the inventor to be his own lexicographer."); *Lear Siegler, Inc. v. Aeroquip Corp.*, 221 USPQ 1025, 1031 (Fed. Cir. 1984); *see also In re Swinehart and Sfiligoj*, 169 USPQ 226, 228 n. 2 (CCPA 1971) ("we are unable to see the merit of any proposition which would require the denial of any claim *solely* because of the *type* of language used to define the subject matter for which patent protection is sought."). It is submitted that the claims, as amended, recite

a phrase that is defined in the specification. Nothing more is required. Accordingly, it is respectfully requested that the rejection be withdrawn.

The Examiner also asserted that "claim 44 is confusing because it is directed to 'a recombinant microorganism' whereas *Gluconobacter oxydans* DSM 4025 is not a recombinant microorganism." (Paper No. 9 at 11).

With a view towards furthering prosecution, claim 44 has been amended to specify that the claimed recombinant microorganism is --obtained from— *Gluconobacter oxydans* DSM 4025. Accordingly, it is respectfully submitted that the rejection is rendered moot and should be withdrawn.

§112, First Paragraph Rejections

1. Written Description

Claims 25, 26, 28, 29, 31, 33-40 and 42-45 were rejected under 35 USC § 112, first paragraph, as containing subject matter that was not described in the specification. (Paper No. 9 at 4-5). In making the rejection, the Examiner contended that "[t]he claims are drawn to or depend from a genus of polynucleotides comprising a polynucleotide encoding SEQ ID NO:4, 6 or 8. The ***function*** of the encoded polypeptides is not limited." (*Id.* at 5).

With a view towards furthering prosecution, claims 25, 26, 28, 29, 31 and 40 have been amended to recite that the claimed recombinant DNA encodes a polypeptide that has the ***specific function*** of conveying "cytochrome *c* oxidase activity to the [cytochrome *c* oxidase] complex when present." It is submitted that claims 25, 26, 28, 29, 31 and 40, as amended, clearly recite a ***specific function*** for the encoded

polypeptides. Accordingly, it is respectfully submitted that the rejection is rendered moot and should be withdrawn.

We also note that a detailed description of an assay for measuring the recited function (*i.e.*, cytochrome *c* oxidase activity) is disclosed in the specification (*see*, for example, page 17, ¶ [0059]), as is a method for isolating the cytochrome *c* oxidase complex from a biologically and/or taxonomically homogeneous culture of a microorganism having the identifying characteristics of *Gluconobacter oxydans* DSM 4025 (*see,* for example, pages 8-9, ¶¶ [0033]-[0035] and Example 1). Furthermore, as acknowledged by the Examiner (*see* Paper No. 9 at 5), claims 25, 26, 28, 29, 31, 33-40, and 42-45 are clearly tied to a ***structure*** (*i.e.*, SEQ ID NOs: 1-8). Accordingly, in view of the ***structural recitation of specific polynucleotide and polypeptide sequences*** in the claims, the ***specific function*** for the encoded polypeptides recited by the claims, and the cytochrome *c* oxidase activity assay disclosed in the specification, the claims as amended are in compliance with the written description requirement of §112, first paragraph. In view of the foregoing, withdrawal of the rejection is respectfully requested.

2. Enablement

Claims 25, 26, 28, 29, 31, 33-40 and 42-45 were rejected under the enablement provision of 35 USC § 112, first paragraph. (Paper No. 9 at 6-7.) In making the rejection, the Examiner asserted that "[t]he claims are directed to a DNA encoding a polypeptide of any length having ***an undisclosed function***. The scope of the claims is not commensurate with the enablement provided by the disclosure with

regard to the extremely large number of encoded polypeptides having the ability to form cytochrome C and ***lacking said functions*** but possibly exhibiting other undisclosed functions." (*Id*).

Initially, we note that the Examiner relies on the so-called *Wands* factors to make the rejection. These *Wands* factors are taken from a case involving hybridoma technology for producing hepatitis B-surface antigen determinants, wherein the Federal Circuit ***reversed*** the Board (and the Examiner) and held that screening large numbers of hybridoma cell lines looking for a "positive" cell line was ***not*** undue experimentation even though the expected number of "positive" cell lines would be low compared to the high number of hybridoma cells that had to be screened (thousands or more). *In re Wands*, 8 USPQ2d 1400, 1406-07 (Fed. Cir. 1988).

With a view towards furthering prosecution, claims 25, 26, 28, 29, 31 and 40 have been amended to recite that the claimed polynucleotide encodes a polypeptide that has the ***specific function*** of conveying "cytochrome *c* oxidase activity to a cytochrome *c* oxidase complex when present." We also note that a detailed description of an assay for measuring this function (*i.e.*, cytochrome *c* oxidase activity) is disclosed in the specification (*see*, for example, page 17, ¶ [0059]), as is a method for isolating the cytochrome *c* oxidase complex from a biologically and/or taxonomically homogeneous culture of a microorganism having the identifying characteristics of *Gluconobacter oxydans* DSM 4025 (*see,* for example, pages 8-9, ¶¶ [0033]-[0035] and Example 1). Accordingly, it is respectfully submitted that claims 25, 26, 28, 29, 31 and 40, as amended, clearly recite a ***specific function*** in the form of cytochrome *c* oxidase activity, and that a detailed assay for measuring the recited function is disclosed in the

specification. For this reason alone, it is respectfully submitted that the rejection is rendered moot and should be withdrawn.

Furthermore, it is well accepted that even a "considerable amount" of experimentation is permissible as long as it is merely routine or if the specification provides a ***reasonable amount of guidance***. MPEP § 2164.05 and *In re Wands*, 8 USPQ at 1404. Claims 25, 26, 28, 29, 31, 33-40 and 42-45, as amended, are clearly tied to a specific structure (*i.e.*, SEQ ID NOs: 1-8), which are disclosed in the originally filed Sequence Listing. In addition, the Examiner acknowledges the ***specific identity*** of six of the recited sequences as encoding parts of the subunits (*e.g.*, COII and COIII) of a cytochrome *c* oxidase complex. (Paper No: 9 at 5). Accordingly, it is respectfully submitted that the specification provides ***ample guidance***, both by disclosing how to measure the ***specific function,*** and by disclosing the ***specific identity***, for the polypeptides encoded by the polynucleotides recited by the amended claims.

Moreover, because all of the claims pending and under examination recite specific sequences identified in the Sequence Listing, confirming whether a polypeptide or polynucleotide (either by itself, or carried on an expression vector or in an organism) contains the recited sequence is a simple matter of using commonly available sequence manipulation computer software, such as, for example, the programs disclosed on pages 10 and 11, ¶¶ [0036] and [0037], of the specification. Accordingly, it is respectfully submitted that ample guidance is provided in the specification for making and using the claimed recombinant polynucleotide expression vectors and recombinant microorganisms. For this reason also, the rejection should be withdrawn.

The Examiner also asserted that the "applicants have not provided sufficient guidance to enable one of ordinary skill in the at to use the claimed invention in a manner reasonably correlated with the scope of the claims broadly including a DNA fragment that comprises DNA encoding SEQ ID NO: 4, 6 or 8 and encodes a polypeptide of ***any undisclosed function***. Without such guidance, the experimentation left to those skilled in the art is undue." (Paper No. 9 at 9).

As set forth above, claims 25, 26, 28, 29, 31 and 40 have been amended to recite that the claimed polynucleotides (and expression vectors and microorganisms containing the polynucleotides) encode polypeptides that have a ***specific function***. Furthermore, the specification provides ample guidance with respect to using the recited polypeptides, polynucleotides, expression vectors, and recombinant microorganisms for producing 2KGA. (*See* pages 13-14, ¶¶ [0045]-[0048] and pages 16-17, ¶¶ [0053]-[0058]). Accordingly, it is respectfully submitted that the rejection is rendered moot and should be withdrawn for this reason as well.

Claims 36 and 44 were also rejected under the enablement provision of 35 U.S.C. § 112, first paragraph. In making the rejection, the Examiner asserted that "[t]he specification does not provide a repeatable process for obtaining the microorganism(s) [DSM 4025] and it is not apparent if the microorganism(s) is/are really available to the public." (Paper No. 9 at 9-10). In making the rejection, the Examiner indicated that "a statement by an attorney of record over his/her signature, and registration number, stating that the specific strain(s) has/have been deposited under the Budapest Treaty and that all restrictions imposed by the depositor on the availability to the public of the

deposited material will be irrevocably removed upon the granting of a patent, would satisfy the deposit requirements." (*Id.* at 10).

In response, the following statements are provided upon information and belief:

The *G. oxydans* strain was deposited under the terms of the Budapest Treaty at the Deutsche Sammlung von Mikroorganismen in Gottingen (Germany) under the following Deposit No.: DSM 4025 on March 17, 1987.

All restrictions imposed by the depositor on the availability to the public of the deposited material will be irrevocably removed upon the granting of a patent.

The Examiner will note that the deposited material is specifically referred to in the specification at page 18, ¶ [0063].

Accordingly, withdrawal of the rejection of claims 36 and 44, respectfully is solicited.

In view of the foregoing, favorable action on the merits, including entry of the amendments, withdrawal of the rejections and allowance of all the claims, respectfully is requested. If the Examiner has any questions regarding this paper, please contact the undersigned attorney.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Commissioner for Patents, Washington, D.C. 20231, on November 7, 2002.

_____
Gonzalo Merino

In re Application of : Akira ASAKURA *et al.*
U.S. Serial No.: 09/712,768
For: CYTOCHROME C OXIDASE ENZYME COMPLEX

EXHIBIT 2

"Marked Up" Amendments to Specification Pursuant to Rule 1.121(b)

[0026] Figure 3 shows an alignment of the partial amino acid sequences of CO I from *G. oxydans* DSM 4025 with ones from other organisms. The sequences shown include a peptide sequence obtained from *G. oxydans* DSM 4025 (SEQ ID NO: 11), and an amino acid sequence deduced from the DNA amplified by PCR from *G. oxydans* DSM 4025 (SEQ ID NO: 13), as well as amino acid sequences from *Paracoccus denitrificans* (SEQ ID NO: 19), *Rhodobacter sphaeroides* (SEQ ID NO: 20), and *Bovine* (Mitochondria) (SEQ ID NO: 21).

[0027] Figure 4 shows an alignment of the partial amino acid sequences of CO II from *G. oxydans* DSM 4025 with ones from other organisms. The sequences shown include a peptide sequence obtained from *G. oxydans* DSM 4025 (SEQ ID NO: 14) and an amino acid sequence deduced from the DNA amplified by PCR from *G. oxydans* DSM 4025 (SEQ ID NO: 25), as well as amino acid sequences from *Paracoccus denitrificans* (SEQ ID NO: 22), *Rhodobacter sphaeroides* (SEQ ID NO: 23), and *Bovine* (Mitochondria) (SEQ ID NO: 24).

[0028] Figure 5 shows an alignment of the partial amino acid sequences of CO III from *G. oxydans* DSM 4025 with those from other organisms. The sequences shown include amino acid sequences deduced from the DNA amplified by PCR from *G. oxydans* DSM 4025 (SEQ ID NOs: 29 and 30), as well as amino acid sequences from

Paracoccus denitrificans (SEQ ID NO: 26), *Rhodobacter sphaeroides* (SEQ ID NO: 27), and *Bovine* (Mitochondria) (SEQ ID NO: 28).

[0029] Figure 6 shows primers for PCR amplification of the partial CO I, II and III genes of the cytochrome c oxidase complex from *G. oxydans* DSM 4025. The sequences shown include the following: the nucleotide sequence of the CO I (A) primer (SEQ ID NO: 31) and its deduced amino acid sequence (SEQ ID NO: 9); the nucleotide sequence of the CO I (B) primer (SEQ ID NO: 32) and its deduced amino acid sequence (SEQ ID NO: 10); the nucleotide sequence of the CO II (A) primer (SEQ ID NO: 33) and its deduced amino acid sequence (SEQ ID NO: 15); the nucleotide sequence of the CO II (B) primer (SEQ ID NO: 34) and its deduced amino acid sequence (SEQ ID NO: 16); the nucleotide sequence of the CO III (A) primer (SEQ ID NO: 35) and its deduced amino acid sequence (SEQ ID NO: 17); the nucleotide sequence of the CO III (B) primer (SEQ ID NO: 36) and its deduced amino acid sequence (SEQ ID NO: 18).

[0031] Figure 8 shows an alignment of the complete amino acid sequence of the CO I subunit from *G. oxydans* DSM 4025 (SEQ ID NO: 2) with those from other organisms. The sequences from other organisms include those from *Bovine* (Mitochondria) (SEQ ID NO: 21), *Paracoccus denitrificans* (SEQ ID NO: 19), and *Rhodobacter sphaeroides* (SEQ ID NO: 20).

[0034] As used herein, the phrase "a biologically and/or taxonomically homogeneous culture of a microorganism having the identifying characteristics of *G.*

oxydans DSM 4025" means a microorganism that has at least 12 out of 14 of the following characteristics of *G. oxydans* DSM 4025:

(a) produces 2-KGA from L-sorbose,

(b) oxidizes ethanol to acetic acid,

(c) oxidizes D-glucose to D-gluconic acid and 2-keto-D-gluconic acid,

(d) exhibits ketogenesis of polyalcohols,

(e) exhibits pellicle and ring growth in mannitol broth (24 hour cultivation) at pH 4 and 5, and pellicle growth in glucose broth at pH 4.5 [pH.45],

(f) does not substantially oxidize glycerol to dihydrooxyacetone,

(g) produces 2-keto-D-glucaric acid from sorbitol and glucaric acid but not from glucose, fructose, gluconic acid, mannitol or 2-keto-D-gluconic acid,

(h) is polymorphic, with no apparent flagella,

(i) produces brown pigment from fructose,

(j) exhibits good growth when co-cultured in the presence of B. megaterium or a cell extract thereof,

(k) is streptomycin sensitive,

(l) is rod-shaped with rounded ends,

(m) has an average cell diameter of about 0.3-0.6 micrometers,

(n) has an average cell length of about 1-1.5 micrometers; and

which microorganism produces 2-KGA from L-sorbose on the level of at least 0.01 g/L of 2-KGA in the culture medium as measured by HPLC. In addition to this, the phrase

"a biologically and/or taxonomically homogeneous culture of a microorganism having the identifying characteristics of *G. oxydans* DSM 4025" should be understood to encompass a microorganism comprising a polynucleotide sequence which hybridizes under high stringency conditions to a polynucleotide sequence which encodes a polypeptide selected from the group consisting of SEQ ID NO:2, 4, 6, and 8, as it is obvious for the person skilled in the art that such a microorganism can be identified based on homology of the amino acid sequences.

EXHIBIT 3

"Marked Up" Amendments to Claims Pursuant to Rule 1.121(c)(1)(ii)

24. (Amended) A recombinant DNA that encodes at least a part of core subunit I of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA comprising [polynucleotide fragment according to claim 23 capable of providing the complex in any one of claims 1 - 9 with cytochrome *c* oxidase activity, wherein] a polynucleotide sequence that encodes an amino acid sequence that is at least 85% identical to SEQ ID NO: 2.

25. (Amended) A recombinant DNA that encodes at least a part of core subunit II of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA [polynucleotide fragment] comprising [the polynucleotide sequence of] SEQ ID NO: 3.

26. (Amended) A recombinant DNA that encodes at least a part of core subunit II of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA [polynucleotide fragment] comprising a polynucleotide sequence that encodes the amino acid sequence of SEQ ID NO: 4.

27. (Amended) A recombinant DNA that encodes at least a part of core subunit II of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA comprising [polynucleotide fragment according to claim 25 capable of providing the complex in any one of claims 1 - 9 with cytochrome *c* oxidase activity, wherein] a polynucleotide sequence that encodes an amino acid sequence that is at least 85% identical to SEQ ID NO: 4.

28. (Amended) A recombinant DNA that encodes at least a part of core subunit III of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA [polynucleotide fragment] comprising [the polynucleotide sequence of] SEQ ID NOs: 5 or 7.

29. (Amended) A recombinant DNA that encodes at least a part of core subunit III of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA [polynucleotide fragment] comprising a polynucleotide sequence that encodes the amino acid sequence of SEQ ID NOs: 6 or 8.

30. (Amended) A recombinant DNA that encodes at least a part of core subunit III of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA comprising [polynucleotide fragment according to claim 27 capable of providing the complex in any one of claims 1 - 9 with cytochrome *c* oxidase activity, wherein] a polynucleotide sequence that encodes a polypeptide that is at least 85% identical to SEQ ID NO: 6, or a polynucleotide that encodes a polypeptide that is at least 85% identical to SEQ ID NO: 8.

31. (Amended) An expression vector comprising [one or more] a recombinant DNA that encodes at least a part of core subunits I, II and III of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA comprising a polynucleotide sequence [fragments] selected from the group consisting of [recombinant] polynucleotide sequences [fragments] encoding the amino acid sequences of SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6 or SEQ ID NO: 8, wherein the expression vector is suitable for expression in an organism.

32. (Amended) An expression vector [according to claim 31 capable of expressing at least one subunit for providing the said complex in any one of claims 1 - 9 with cytochrome *c* oxidase activity,] comprising a recombinant DNA that encodes at least a part of core subunits I, II and III of a cytochrome *c* oxidase complex and that conveys

cytochrome *c* oxidase activity to the complex when present, the recombinant DNA comprising a polynucleotide sequence [fragment] selected from the group consisting of a polynucleotide encoding [encodes] a polypeptide that is at least 85% identical to the amino acid sequence of SEQ ID NO: 2, a polynucleotide encoding a polypeptide that is at least 85% identical to the amino acid sequence of SEQ ID NO: 4, a polynucleotide encoding a polypeptide that is at least 85% identical to amino acid sequence of SEQ ID NO: 6, [and] a polynucleotide encoding a polypeptide that is at least 85% identical to the amino acid sequence of SEQ ID NO: 8, and combinations thereof.

37. (Amended) An expression vector according to claim 34 [36], wherein the bacteria is a biologically and/or taxonomically homogeneous culture [biological or taxonomic homolog] of a microorganism having the identifying characteristics of *Gluconobacter oxydans* DSM 4025.

40. (Amended) A recombinant microorganism comprising at least one recombinant DNA that encodes at least a part of core subunits I, II and III of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA comprising a polynucleotide sequences [or polynucleotide fragment] selected from the group consisting of a polynucleotide sequence of SEQ ID

NO: 1, a polynucleotide sequence [fragment] that encodes the amino acid sequence of SEQ ID NO: 2, a polynucleotide sequence [fragment] of SEQ ID NO: 3, a polynucleotide sequence [fragment] that encodes the amino acid sequence of SEQ ID NO: 4, a [the] polynucleotide sequence [fragment] of SEQ ID NO: 5, a polynucleotide sequence [fragment] that encodes the amino acid of SEQ ID NO: 6, a polynucleotide sequence [fragment] of SEQ ID NO: 7, [and] a polynucleotide sequence [fragment] that encodes the amino acid sequence of SEQ ID NO: 8, and combinations thereof.

41. (Amended) A recombinant microorganism [according to claim 40,] comprising at least one recombinant DNA that encodes at least a part of core subunits I, II and III of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the complex when present, the recombinant DNA comprising a polynucleotide sequence [or polynucleotide fragment] selected from the group consisting of a polynucleotide sequence [fragment] that encodes an amino acid sequence that is at least 85% identical to the amino acid sequence of SEQ ID NO: 2, a polynucleotide sequence [fragment] that encodes an amino acid sequence that is at least 85% identical to the amino acid sequence of SEQ ID NO: 4, a polynucleotide sequence [fragment] that encodes an amino acid sequence that is at least 85% identical to the amino acid sequence of SEQ ID NO: 6, [and] a polynucleotide sequence [fragment] that encodes

an amino acid sequence that is at least 85% identical to the amino acid sequence of SEQ ID NO: 8, and combinations thereof [to express at least one core subunit for providing the said complex in any one of claims 1 - 9 with cytochrome *c* oxidase activity].

44. (Amended) A recombinant microorganism according to claim 43, wherein the microorganism is obtained from *Gluconobacter oxydans* DSM 4025.

45. (Amended) A recombinant microorganism according to claim 40 [44], wherein the microorganism is a biologically and/or taxonomically homogeneous culture [biological or taxonomic homolog] of a microorganism having the identifying characteristics of *Gluconobacter oxydans* DSM 4025.

46. (Amended) A process for producing a cytochrome *c* oxidase complex [as set forth in any one of claims 1 - 9] comprising:

(a) cultivating in a culture medium a recombinant microorganism comprising at least one recombinant DNA that encodes at least a part of core subunits I, II and III of a cytochrome *c* oxidase complex and that conveys cytochrome *c* oxidase activity to the

complex when present, the recombinant DNA comprising polynucleotide sequences [or polynucleotide fragment] selected from the group consisting [a polynucleotide sequence] of SEQ ID NO: 1, a polynucleotide sequence [fragment] that encodes the amino acid sequence of SEQ ID NO: 2, a polynucleotide sequence [fragment] that encodes an amino acid sequence that is at least 85% identical to the amino acid sequence of SEQ ID NO: 2, [a polynucleotide fragment of] SEQ ID NO: 3, a polynucleotide sequence [fragment] that encodes the amino acid sequence of SEQ ID NO: 4, a polynucleotide sequence [fragment] that encodes an amino acid sequence that is at least 85% identical to the amino acid sequence of SEQ ID NO: 4, [the polynucleotide fragment of] SEQ ID NO: 5, a polynucleotide sequence [fragment] that encodes the amino acid of SEQ ID NO: 6, a polynucleotide sequence [fragment] that encodes an amino acid sequence that is at least 85% identical to the amino acid sequence of SEQ ID NO: 6, [a polynucleotide fragment of] SEQ ID NO: 7, a polynucleotide sequence [fragment] that encodes the amino acid sequence of SEQ ID NO: 8, [and] a polynucleotide sequence [fragment] that encodes an amino acid sequence that is at least 85% identical to the amino acid sequence of SEQ ID NO: 8, and combinations thereof [for providing the complex in any one of claims 1 - 9 with cytochrome *c* oxidase activity]; and

(b) recovering cytochrome *c* oxidase from the culture.